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The preparation of a magnetic-sound track for 16mm. motion picture films is described. In script preparation, the script should be written in narrative form to include all shots needed and to supplement and give information not in the film. Language should be kept simple, and unavoidable technical terms should be explained. In rewriting the narrative, edited pictures and time lengths of each scene should be projected. Scripts should be written in sections so that a suitable resting spot can be chosen since narrators tire and become tense. In recording preparation, trail recordings should be made to check equipment, microphone placements, acoustics, and background noises. Recording should take place in the same setting and at one sitting because acoustics change from time to time. When using the microphone, the speaker should stay at the same location by the microphone, the reading rate should be paced, and copy should be rewritten to avoid slowing or hurrying. A personable voice should be selected. For lip synchronization, camera, tape-recorder, and magnetic-recording projector should be fitted with synchronous motors. Background music which supplements the story should be used to indicate change of time, mood, or place. Distortion factors and sources of outside interference should be eliminatted. Full-track, single-perforated film should be operated at 24 frames per second to obtain the best sound track results.

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TEACHING AND TRAINING WITH MOTION PICTURES (Magnetic Sound)

Bell & Howell • 7100 McCormick Road • Chicago 45, Ill.

INSTRUCTIONAL TECHNOLOGY - U.S.C.

MAGNETIC-SOUND PROJECTORS IN INDUSTRY, SCHOOLS, CHURCHES

There are many ways of preparing a magnetic-sound track for 16mm motion picture films. In this booklet is a suggested procedure. Many variations will evolve because of individual film requirements, physical facilities, etc.

A satisfactory sound track may be prepared by using the microphone only, without sound effects or musical background. In fact, there is a tendency to use excessive amounts of music and sound effects on simple stories, thus detracting from the picture content.

Sound effects and musical background should only be used in sequences where they support the picture story.

Before outlining the process of recording, let us review some of the potential uses of magnetic-sound films.

IN INDUSTRY

A potent selling force for merchandising your product; effective device for sales training, employee or public relations, foreign trade and many other applications, including:

Job Training
Safety Films
Annual Reports
Field Service Films
Employee Indoctrination
Time and Motion Study Films
Engineering Progress Films

IN SCHOOLS

Magnetic-sound recordings open the door for more and better audio-visual education ... for every age and interest group ... at low cost. Just a few of the possibilities follow.

Safety Training
PTA – Club Work
Alumni Relations
Community Relations
Athletic Department Use
Foreign Language Training
Teaching Specialized Subjects
Up-Dating Obsolete Sound-Tracks
Changing Sound-Tracks for
Different Learning or Age Levels

IN CHURCH WORK

A "missionary" in foreign lands; a fund-raiser for charitable institutions, plus ...

Church School Training
Community Relations
Holiday Programs
Social Activities
Church History Recordings
Hospital – Club Group Work
Foreign Language Presentations

ADDING MAGNETIC-SOUND TO MOVIES

It is obvious that the preferred approach to convey the messages of the above group of films will vary. Now let us examine the physical methods of preparing a sound track – either for a silent or optical-sound film or a movie to be filmed for your use.

SCRIPT PREPARATION

The story must be told pictorially by the motion picture. Write the script to include all the shots needed. Remember – the narration supplements the picture and gives information not contained in the film.

In the original script, write the narrative to give an approximate story. Invariably it will have to be rewritten to match the edited print.

During the process of shooting you may find it necessary to change the photo production and change some of the subject material. Or, you may decide to delete a shot or two. Additional information might be obtained since starting the shooting to change the original scenario.

REWRITING NARRATIVE

Project the edited picture and time the length of each scene. Prepare a separate sheet for each scene, giving a brief description and the time in seconds.

Do not jam the scene with voice. Allow two words per second; three words per second is maximum, and it takes a fast speaker to read it aloud.

By spacing copy you can change tempo of the picture. Make sure the copy fits the scene and project each scene as you rewrite. Do not describe past scenes, action taking place in the picture, or anticipated future scenes.

Keep words, phrases, and sentences simple to enable your audience to understand the first time. Use technical words sparingly, unless the film is for a technical audience. For the average group, explain and clarify any unavoidable technical terms.

Write copy in sections so that a suitable resting spot can be

chosen, but complete any final changes, corrections, or modifications of the master script before the recording session. Narrators get tired and delays during recording cause nervous tension which offsets the narrator's voice and delivery.

Select music only if it helps to tell the story. Music alone may interpret a scene better than the narrator can. Write "in" all of the musical cues and selections.

RECORDING PREPARATION

After your picture has been filmed and edited, you will be ready to add the magnetic-sound track.

Before you do any serious recording, make several trial recordings, and rearrange the equipment to suit your specific needs.

Microphone placement is very important since different locations in the same room will produce varying effects. The acoustics of the room will determine the best position for the microphone. One section of the room may give you a reinforcement of a sound, whereas another section of the room will give you an attenuation of the sound or cause a dead sounding effect. It is best to get some reverberation in your recording to liven the voice. A slight amount of reverberation lends brilliance to the voice while too much reverberation causes a hollow sound. Avoid "dead rooms," since normal everday listening contains a certain amount of reverberation – any recordings made in a dead room will sound unnatural.

Check your room for background noises, such as heavy motors running, or any other extraneous noises which may be present.

Do all of your recording in the same room and at one sitting, if at all possible. The acoustics of the room may change from day-to-day due to changes of humidity, or moving of furniture.

Matching the recording level from day-to-day is difficult even when controls are marked. Changes in line voltage will change the over-all amplification of the recording system. Prepare a cue sheet bearing the necessary information for the narrator and for the proper timing of background and sound effects.

MICROPHONE TECHNIQUE

The apparent ease of the radio commentator as he delivers commercials is the result of long training and practice. Very few people are "naturals." Do not be discouraged if your recordings do not compare favorably with stage, radio, and screen stars. The quality of the voice and inflections will improve with practice.

Pace your reading rate. It is difficult to speak faster than normal and maintain the fast rate throughout the picture. The same reasoning applies to a slower than normal rate. Above all, do not race to make up time during a given scene. If the commentary cannot be added during the time allotted; rewrite the copy.

Beginners have a bad habit of wandering from the microphone. Don't do it. The narrator's body shields the microphone from background noises. As you move about, the recording level and background noise will change correspondingly.

Proper breathing is just as important to the commentator as it is to the singer. Take a breath often; after every phrase or two. If you permit yourself to run out of breath before you finish a phrase or sentence, the voice will sound strained.

SELECTING A VOICE

If you prefer to have somebody else narrate the copy, choose a "voice" that can be naturally associated with the subject of the film. Since the voice is "off stage," words cannot be

emphasized with gestures. The personality must be in the voice.

A good voice is one that is intelligible, clear, informal and authoritative. It must convey the feeling that the narrator is well informed and knows his subject well. A big name commentator does not always make a good narrator. Remember -- the subject of the film is the star. Not the voice!

To use an old adage -- "practice makes perfect." Rehearsals help the narrator get familiar with the film and copy. He develops a conversational tone rather than a reading tone.

LIP SYNCHRONIZATION

For best results in lip synchronization, all three units -- camera, tape recorder, and magnetic-recording projector should be fitted with synchronous motors. In this way the film and the sound track can be made to run in perfect synchronism at all stages. When synchronous equipment is used, you record the sound at the same time you take the picture. Here the "clap-stick" routine will be particularly helpful.

Use a clap-stick or some similar means whereby motion and sound can be readily synchronized for recording on the projector (the simple action of clapping the hands in front of the subject -- when camera and recorder are operating -- will suffice). When your film has been processed and soundstriped, transfer your recording to it by means of the projector. Simply plug the tape recorder output into the microphone jack. Even though you have used the clap-stick arrangement, it will be helpful to put visible cue marks on tape and film, by means of a grease pencil or colored cellulose tape.

After the film has been processed and soundstriped, you locate the motion on the film which corresponds to the "clap" sound on the tape. The tape recorder is plugged into the mike input of the projector. The projector recording volume level is set as required. Then, when both pieces of equipment

are started in unison they will run in synchronism throughout the length of the film, the sound being transferred from tape to film. Care must be used in starting both units at the right spot.

BACKGROUND MUSIC

Musical moods and backgrounds are selected to match the picture subject material. Scenic shots call for pastoral music. Light industry and general activity are supplemented with light lilting music. Heavy machinery in operation and heavy mobile units in action call for heavy movement music.

Select your music which is in the public domain. Generally speaking, such music is more desirable since the background music should be as unobstructive as possible. Popular tunes and melodies distract the audience's attention from the pictorial story. Do not use vocal selection. However, a chorus can sometimes be used to lend the proper mood. Get permission from the copyright owners for all selections used.

After selecting the records, check the dynamic range. Dynamic range is a characteristic which determines the maximum loudness level and the minimum recording level in any given record. Each record has a different dynamic range. Mark the volume control setting required for each record.

Proper blending of voice and music will add considerably to the picture. While the commentator is adding the narration, fade the music out completely so that the principle aural interest is the commentator's voice and not the music. With high background music during the narration, the audience will be inclined to listen to the music rather than to the commentator. Always fade music in and out slowly to create illusion of reality.

Avoid the use of fanfare. Do not use it except for psychological reasons and then very sparingly.

The purpose of a musical transition is to transfer the

listener from one group of scenes to another as unobtrusively as possible. Sound effects and musical moods can be used just as effectively as photographic fades and dissolves, and should be used to indicate change of time, mood or place.

DISTORTION FACTORS

Although magnetic-recording is simple, a few fundementals should be observed in order to get the best recording.

Record and play back the complete film with a test recording before making the final recording. You may find some of the splices will not hold and may need to be remade. A broken splice during a recording is discouraging. If any corrective measures have to be taken, do so before the final narration has been added.

Magnetic-soundstripe has a definite maximum magnetizing characteristic. Magnetizing the soundstripe beyond this limit causes an overload distortion. If recordings are made beyond this saturation point, the sound will be muffled and somewhat reduced in level.

Recording at too low a level should also be avoided. All electrical reproducing systems and tapes have basic inherent noise factors. If the recording is too low and excessive amplification is needed to play back at a loud level, the inherent noises will also be amplified, resulting in poor signal-to-noise ratio.

Speaking too close to a mike causes serious distortion when a loud voice is used. For normal use, speak at a distance of approximately 12" to 16" from the microphone. If the background noises in a room are excessive, speak with the microphone held approximately 6" from the lips.

The input circuits to your recording amplifier also have limitations. Feeding too strong a signal into either the phono jack or into the microphone jack will cause distortion even before the signal is applied to the magnetic stripe. The

accessory 3-speed turntable offered by the Bell & Howell Company, comes equipped with a separate volume control. Other types of phonographs may deliver too strong or too weak a signal, since the pickup cartridges vary in sensitivity. If a different make turntable is to be used, we suggest that several trial recordings be made at various recording levels to determine the point at which overloading takes place.

Here are a few hints on possible other sources of distortion. Dirt accumulated on the recording head will prevent the film from making intimate contact. Keep the heads clean at all times and clean after each showing. Apply the same precautions for cleaning as you would for any lens, because the surfaces of the heads are highly polished and any scratches will also cause distortion.

Do not use magnetized tools in the vicinity of the heads or the amplifier. If the heads become magnetized or you suspect that heads are magnetized and causing distortion, return machine to your local Bell & Howell Service Station for demagnetization.

Poorly made splices will cause holes in recordings(quiet spots in sound tracks). A well-made splice will pass unnoticed or with a very slight bloop. But, if excessive cement is used, sections of the track material may be removed beyond the splice area and will cause a pronounced thump as it passes over the heads, (provided there is a recording on this section).

SOURCES OF OUTSIDE INTERFERENCE

Another form of distortion which is very annoying is the presence of noise in the recording.

Microphone cables can pick up hash and noise if they are strung along other electrical circuits carrying power to neon signs, diathermic machines, etc.

The magnetic heads may pick up extraneous hum caused by close proximity of the turntable motor or other rotating electrical devices.

Since tape recorders are frequently used to feed signals into the projector amplifier, make sure the ground connection between the tape recorder and the amplifier is good. Loose connections will cause intermittent noises. Improper ground connections may cause excessive hum pickup in the connecting circuits.

Hash and popping noises are sometimes transmitted through the power lines directly into the amplifier. If this noise persists, contact your local radio serviceman to install line filtering systems. Rattling the microphone cable or knocking it against other objects will cause microphonic sounds to be recorded.

COLLECTING SOUND EFFECTS LIBRARY

Since sound effects lend reality to picture, a good library of sound effects should be maintained.

Build a tape library of sound effects and background noises, such as motor and traffic noises, outboard motors, fire sirens, bells ringing, (phone, church, fire) door chimes, laughter of crowds, applause, general hustle and bustle of crowds, shuffling of feet, dogs barking, children laughing and shouting at play, roar of the football crowd, zoo noises, and other noises which are so prevalent in everyday walks of life.

When collecting sound effects, record all sounds on the spot. The unwanted sections can be edited at your leisure.

Select and classify the various sounds. and transfer these onto a category reel for permanent storage, There is little or no change in fidelity when making magnetic copies.

With an established sound effects library, split-second cueing can be simplified by preparing a third copy of the desired

sound effect. Re-record this third copy successively to produce a continuous record. Thus with a repetitive sound track, the tape recorder can be started before the cue on the film, and then cut in at the exact moment. Obviously, sound effects that start at a low level and build up to a crescendo and then fade out must be cued more accurately for a single passage.

TYPES OF SOUND TRACK

With the many types of sound tracks available, the beginner may be tempted to intermix single-perforated full-track film with double-perforated film, or with half-track film. This is not advisable since the playback levels of the various films differ and will cause a rise or fall in sound level as the film type changes.

If it is found desirable to "cut-in" stock shots which have been taken on double-perforated film, request a quarter-stripe to be added to the complete reel so that the sound level will remain constant during the playback sequence.

There are three types of sound track, (full-track, half-track and double-perforated, quarter-track) each of which can be recorded at either 16 frames per second or 24 frames per second. This gives a combination of six possible applications, each type with specific limitations and capabilities.

It is recommended that full-track, single-perforated film, operated at 24 frames per second, be used whenever possible. The resulting sound quality is superior to 16 frames per second recording and is also superior to half-track or quarter-track double-perforated film.